seem to have a marked effect upon water loss. With the latter phenomenon is associated an abundance of pulvini.

The report is to be commended as an attempt to apply quantitative methods in an almost untouched field.—GEO. D. FULLER.

Heated soils.—JOHNSON[10] has done a very critical and exhaustive piece of work on the effect of heating soils at various temperatures on the germination of seeds and later growth of plants in such soils. The heating at 114–116° C. was done in an autoclave; at higher temperatures the heating was done with air-dry soils in dry ovens. The duration of heating was about 2 hours.

Soils heated at 100–115° C. gave temporary retardation of germination and seedling growth, followed later by a great increase in rate of growth. The extent of these varied greatly with the soil, seed, and plants used, and with other environmental conditions. The injury increased as the temperature rose up to 250° C. As the temperature rose above 250° C. the injury decreased until it was nil with heating at 350° C. or above. The time of recovery from the toxic effects was proportional to the intensity of the toxicity. Soils showed considerable variation in the degree of effect of heating. This variation cannot be explained on the basis of any one characteristic of the soil, but seems to result from a combination of a number of its characters.

Seeds varied in their sensitiveness. Lettuce and clover are very sensitive, and wheat, buckwheat, and flax are resistant. Gramineae and Cucurbitaceae are usually resistant, while Leguminosae and Solanaceae are more sensitive. There is great variation in the response of the growing plants. Heated soils that proved very injurious to some plants, as tomatoes, may be beneficial to others, as wheat. In general, but not always, there is a parallel between the sensitiveness of germination and of the later growth of the seedling. *Pyronema*, some other fungi, and some bacteria grow best in soils heated to 250° C., and fall off in growth rate with soils heated to higher or lower temperatures.

The ammonia content of soils is highest in those heated at 250° C., and diminishes as the temperature of heating rises or falls. The same is true of the concentration of the soil solution, so that there is a rough parallel between these characters of the soil and the degree of toxicity or later increased growth. Adsorptive capacity of the soil modifies the action of the toxic substance. In soil extracts the toxicity is more nearly correlated with the concentration of the ammonia. Additions of ammonia to soil produce effects similar to heating. The author believes the toxic action of heated soils is largely due to ammonia existing as ammonium carbonate. He thinks other factors are involved in so-called "chemical" injuries.

The toxic material in heated soils is volatile. It is also changed into non-toxic form when the soil is kept under conditions favoring growth of organisms. The latter is due to soil flora, and, contrary to PICKERING, does

[10] JOHNSON J., The influence of heated soils on seed germination and plant growth. Soil Science 7:1–87. 1919.

not occur under aseptic conditions. The amount of ammonia apparently may increase as organisms reduce the toxicity. The ammonia is assumed in this case to exist in delicate transition stages detected by analysis, but not in toxic form. The soils heated above 250° C. are supposed to be less toxic because much of the ammonia is volatilized by the high temperatures.

The author believes that heating to very high temperatures does not change the quality of the effects gained by heating at ordinary sterilizing temperatures, but merely makes these effects more marked by quantitatively intensifying them. His results, therefore, are valuable in elucidating the effects of sterilizing soils by heat.—WM. CROCKER.

Vegetation of an antarctic island.—Lying 600 miles southwest of New Zealand, 920 miles southeast of Tasmania, and 970 miles from the antarctic continent, Macquarie Island is in a position of great isolation. It is little more than a short range of mountains with peaks ranging from 900 to 1424 ft. in height, the length of the island being 21 miles and its breadth less than 4 miles. The hills descend rapidly toward the sea, forming bold headlands and precipitous cliffs with no harbors or sheltered bays. It possesses a remarkably equable temperature, the mean maximum being 43°.5 F. and the mean minimum 37°.9 F., while the extreme range is only 25°.8 F. A rainfall of 45 inches is distributed so that no month has less than 3 inches. Wind velocity is uniformly great, averaging 18 miles per hour.

It has an impoverished vascular flora of 30 seed plants, 3 ferns, and 1 lycopod. Concerning the origin and affinities of this flora, CHEESEMAN[11] decides that with the exception of 3 endemic grasses it dates back no farther than the last glacial epoch. Its repopulation was probably affected through the agency of birds, as half its species are common to New Zealand, 15 are found also in Fuegia or South Georgia, and a like number are circumpolar.

The vegetation is characterized by the entire absence of trees and shrubs. The conspicuous plant forms are the tussock grasses, principally *Poa foliosa*, the large leaved "Macquarie Island cabbage," *Stilbocarpa polaris*, an Araliaceous plant resembling a fine rhubarb, the cushion of *Azorella Selago*, globular mosses often 4 ft. across, and a purple flowered Composite, *Pleurophyllum Hookeri*, with long sage green leaves. Of these the tussock grass is most abundant, occupying much of the hillside slopes.—GEO. D. FULLER.

Journal of the Arnold Arboretum.—This new quarterly journal has been established to secure "the prompt publication of information about trees and shrubs collected at the Arnold Arboretum," which was a function of *Garden and Forest* (1887–1897). The first number (July 1919) includes the fifth paper of CAMILLO SCHNEIDER entitled "Notes on American willows" (pp. 1–32);

[11] CHEESEMAN, T. F., The vascular flora of Macquarie Island. Sci. Rep. Australian Antarctic Expedition of 1911–14. Series C. vol. 7. pt. 3. pp. 63. map. 1919.